

Figure Three: Ogden Test Locations

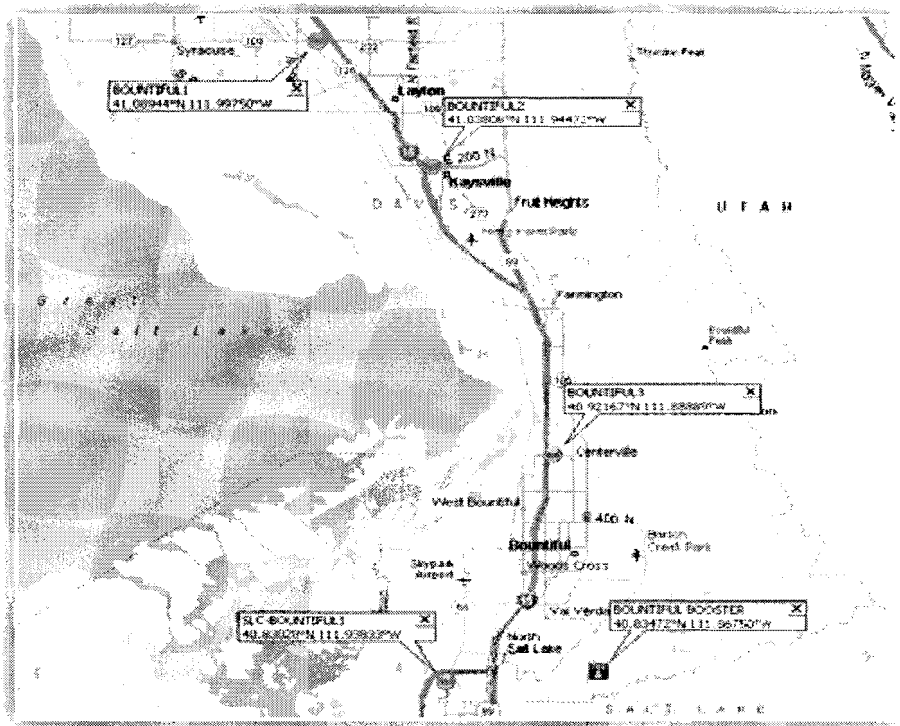


Figure Four: Bountiful Test Locations

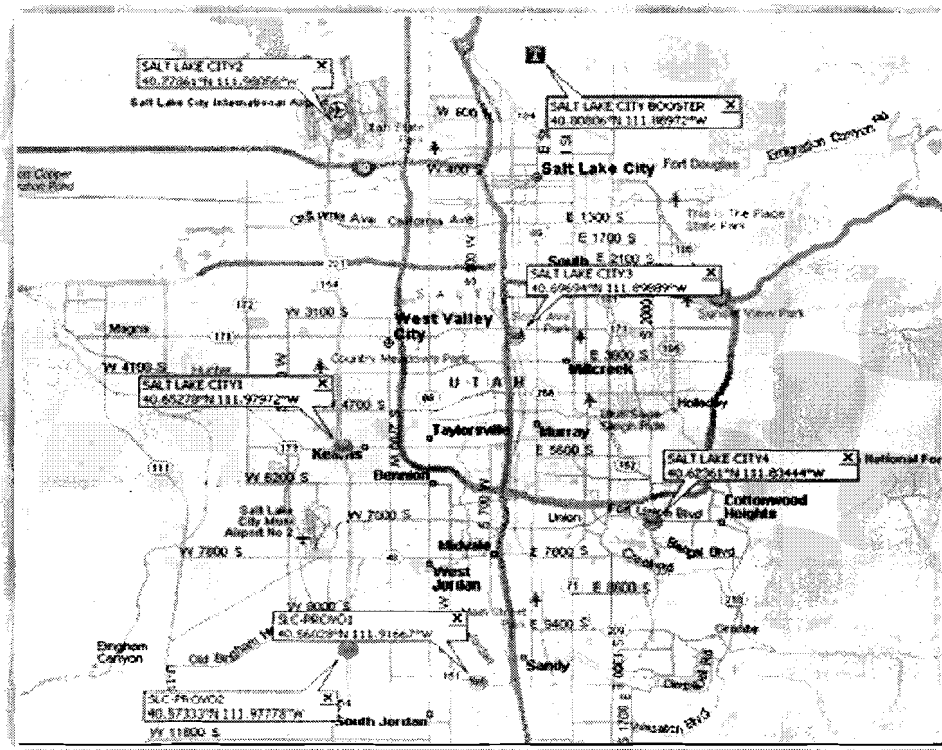


Figure Five: Salt Lake City Test Locations

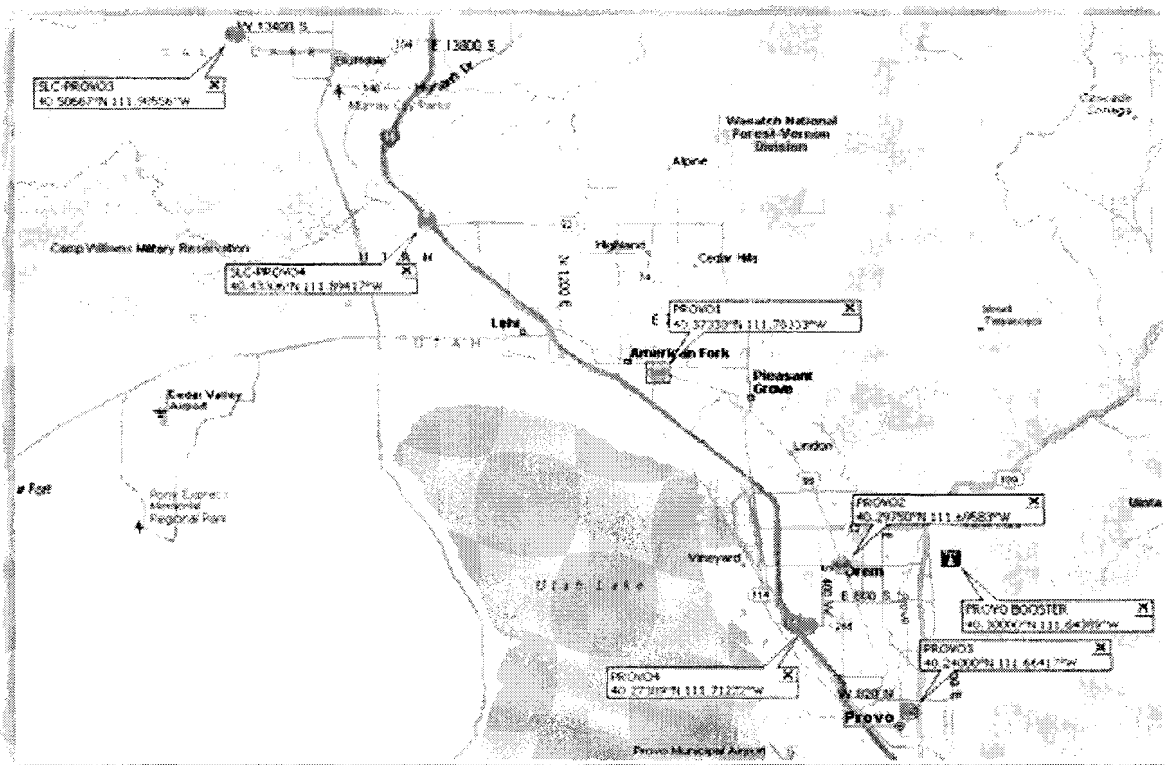


Figure Six: Provo Test Locations

NAMING CONVENTION OF MEASUREMENT LOCATIONS

Each of the 20 test locations was given a name based on both the proximity to the closest booster and the estimated booster coverage zone that it existed. The following table indicates the distances from a test location to relevant booster(s).

| COORDINATES | | LOCATION | BOOSTER DISTANCE (MILES) | | | |
|-------------|-------------|------------------------|--------------------------|-----------|-------|-------|
| North | West | | Ogden | Bountiful | SLC | Provo |
| 41-18-24.8 | 112-1-25.0 | OGDEN1 | 9.75 | 33.59 | | |
| 41-14-39.8 | 111-58-13.1 | OGDEN2 | 5.89 | 28.78 | | |
| 41-11-21.0 | 111-58-59.0 | OGDEN3 | 2.30 | 25.19 | | |
| 41-7-28.9 | 112-1-32.9 | OGDEN-BOUNTIFUL1 | 8.17 | 26.31 | | |
| 41-5-22.0 | 111-59-51.0 | BOUNTIFUL1 | 5.35 | 18.85 | 19.63 | |
| 41-2-17.0 | 111-56-41.0 | BOUNTIFUL2 | 9.54 | 14.60 | 8.35 | |
| 40-55-18.0 | 111-53-20.0 | BOUNTIFUL3 | 18.08 | 6.10 | 7.84 | |
| 40-49-49.0 | 111-56-18.0 | SLC-BOUNTIFUL1 | | 3.73 | 2.97 | |
| 40-39-10.0 | 111-58-47.0 | SALT LAKE CITY1 | | 13.87 | 11.71 | |
| 40-46-43.0 | 111-58-50.0 | SALT LAKE CITY2 | | 7.08 | 5.18 | |
| 40-41-49.0 | 111-53-56.0 | SALT LAKE CITY3 | | 9.65 | 7.68 | |
| 40-37-25.0 | 111-50-4.0 | SALT LAKE CITY4 | | 14.67 | 13.05 | |
| 40-33-37.0 | 111-55-0.0 | SLC-PROVO1 | | | 17.16 | 23.01 |
| 40-34-24.0 | 111-58-40.0 | SLC-PROVO2 | | | 16.84 | 25.80 |
| 40-30-24.0 | 111-59-8.0 | SLC-PROVO3 | | | 21.40 | 22.98 |
| 40-25-59.0 | 111-53-39.0 | SLC-PROVO4 | | | 25.88 | 16.09 |
| 40-22-24.0 | 111-47-0.0 | PROVO1 | | | | 8.93 |
| 40-17-51.0 | 111-41-45.0 | PROVO2 | | | | 2.75 |
| 40-14-24.0 | 111-39-51.0 | PROVO3 | | | | 4.28 |
| 40-16-26.0 | 111-42-44.0 | PROVO4 | | | | 4.04 |
| 41-9-57.0 | 112-0-52.0 | OGDEN BOOSTER | | | | |
| 40-50-5.0 | 111-52-3.0 | BOUNTIFUL BOOSTER | | | | |
| 40-48-29.0 | 111-53-23.0 | SALT LAKE CITY BOOSTER | | | | |
| 40-18-0.0 | 111-38-38.0 | PROVO BOOSTER | | | | |

Table Three: Booster Naming Convention

TEST MEASUREMENT EQUIPMENT AND RESULTS

The Audemat-Aztec FM-MC4™ was used to collect the audio samples in the field. The FM-MC4™ is a professionally calibrated FM receiver with a GPS receiver, and all the measurements are automatically logged. It is an FCC approved calibrated receiver supplied with a calibrated antenna.

GoldenEar™ is a software product which was used with the FM-MC4™ Measurement Receiver. It is intended to evaluate the overall quality of an FM station reception through signal measurements and audio recording.

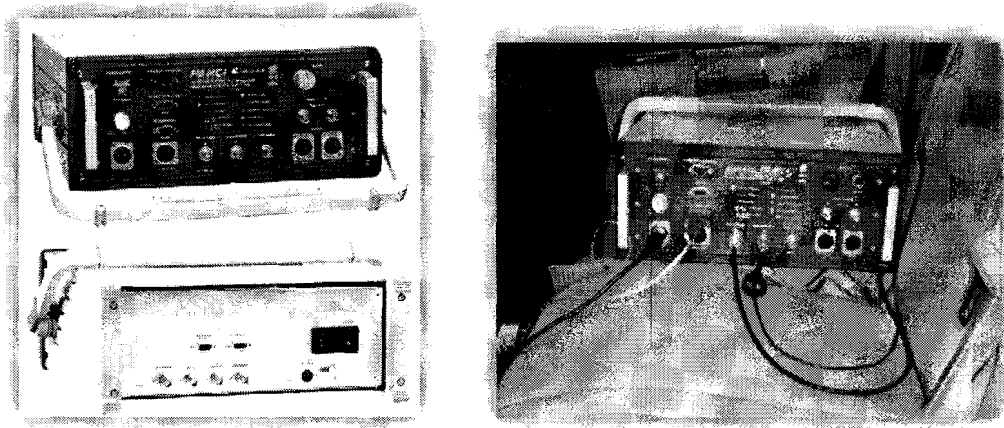


Figure Seven: Audemat FM-MC4™

An example of a GoldenEar™ multipath plot is shown for the Salt Lake City test locations:

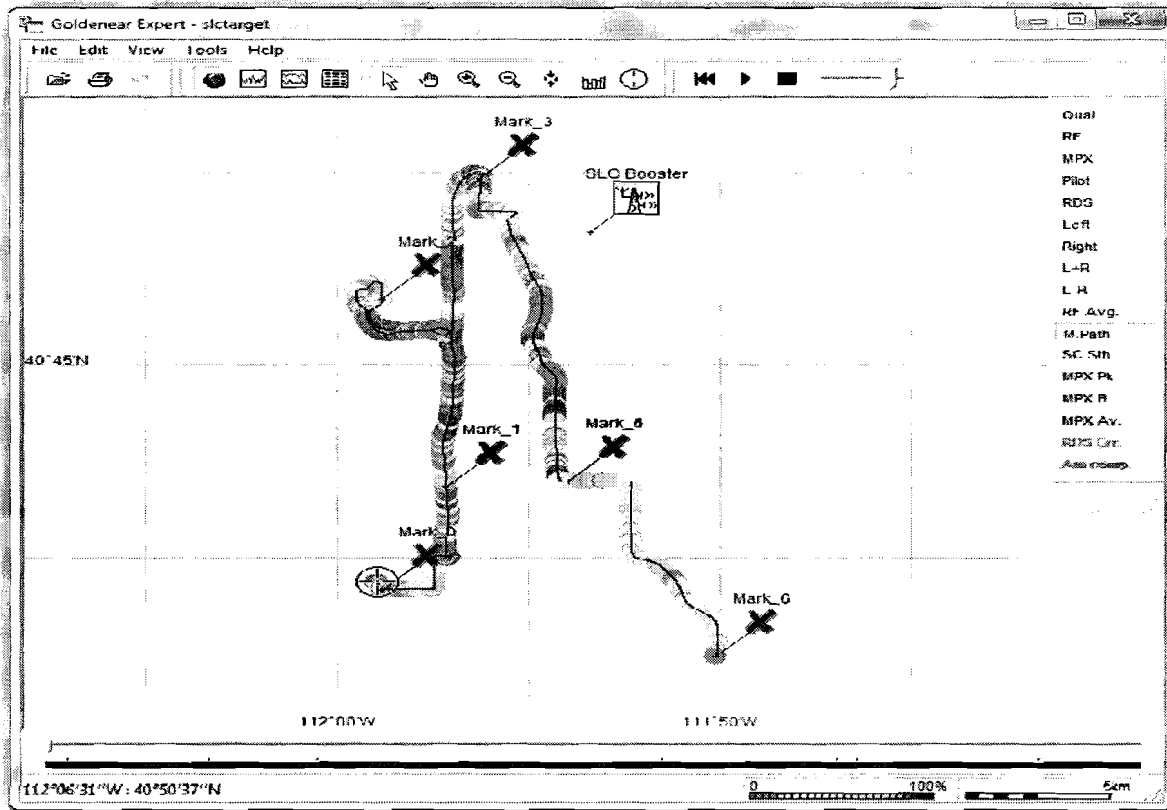


Figure Eight: GoldenEar™ SLC Plot

The FM-MC4 enables the following main operations to be carried out on a FM audio signal:

- Quantifying the signal value constituting the Base-band MPX signal
- Quantifying the MPX signal's power value
- Quantifying the demodulated signals' value constituting the audio message
- Ensuring different processing of these quantifications (corrections, averages, statistical calculations, phase, synchronization)
- Ensuring different representations of these quantifications.

The FM-MC4 measurement receiver is also acquires raw data from the FM broadcasting station. These signals are read in digital form through the PC interface. They include:

- RF level
- MPX and sub-carriers (19 kHz Pilot)
- Demodulated audio signals (Left, Right, Left+Right, Left-Right)
- Stereo information.

From these raw signals, several calculated signals are deduced:

- Averaged RF level
- Multipath ratio
- Sub-carrier stability (variation ratio over nominal level)
- MPX exceeding (over nominal level)

The first signal processing is done within the FM-MC4™. The signal concerned by the acquisition is the Multiplex signal whose format is defined by a maximum pass-band of 100 kHz. This analog MPX signal is converted into a digital signal using an A/D converter. Sampling frequency is fixed at 256 kHz, which guarantees quantification of any signal up to theoretical maximum frequency of 128kHz. For subjective listening the audio output of the receiver was recorded digitally in a (CCIT 22.050 kHz, 8-bit, stereo, 43 Kbps sampling rate) WAV file format by the GoldenEar™ software.

In term of RF signal level, two output methods are possible and both are presented:

Relative field: dBμV/m, mV/m

Absolute field: dBμV, dBm

For conversion of the Absolute field (dBμV) into a Relative field (dBμV/m), several calibrated files are supplied with the FM-MC4™, including: K coefficient validation, RF Antenna and Cable validation, and Loss and Gain validation. Appendix One contains details on these files.

The GoldenEar™ software is meant to provide a numerical method for quantifying a pure subjective concept, which is quality of received FM audio. As the method is a numerical one, it will be applied every time the same way, therefore it is an objective measure, as opposed to having numerous subjects listen and evaluate the audio.

An example graphical output is shown below, indicating RF level (Green), Pilot Stability (Dark Blue), Multipath Ratio (Grey), and L+R (Light Blue), for a portion of a stationary PSA measurement recording.

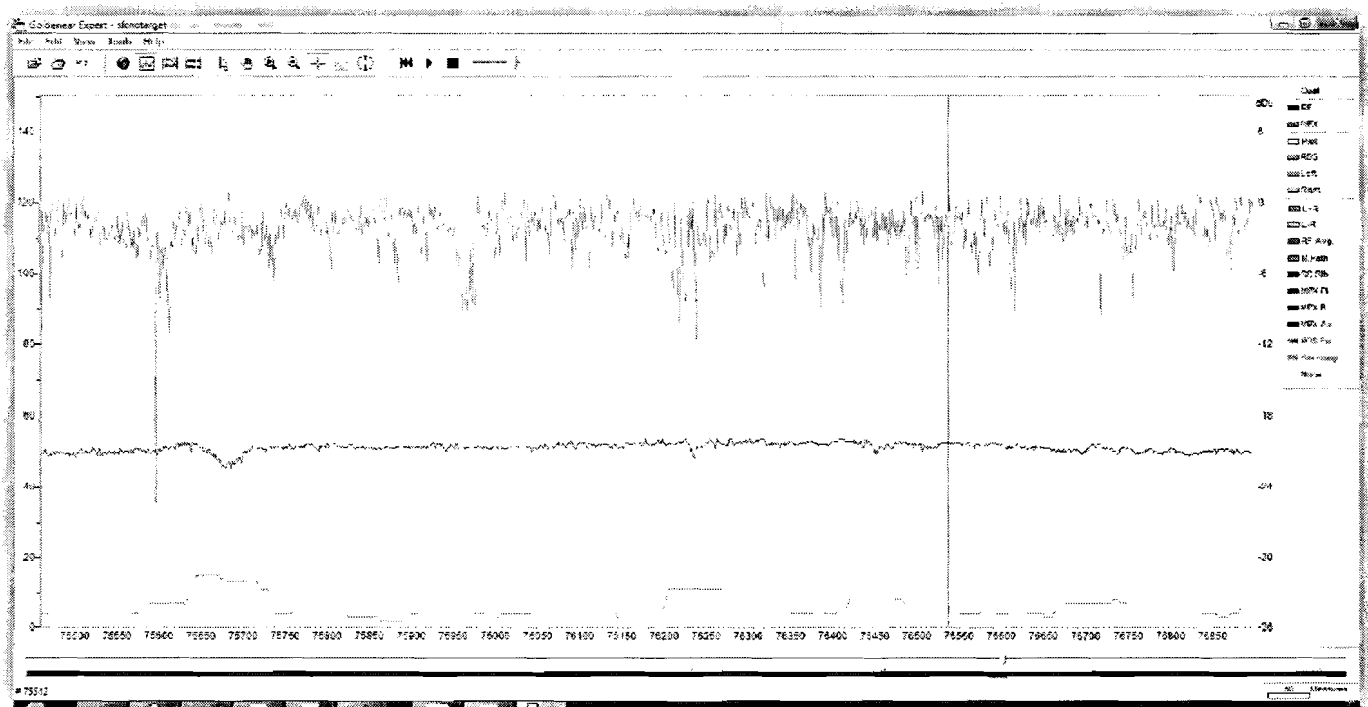


Figure Nine: GoldenEar™ Signal Display

MEASUREMENT VEHICLE

The measurement vehicle used in this test was a 2010 Ford Flex Crossover AWD. It was chosen because of the very large, flat metal roof with no obstructions, providing a ground plane to minimize pattern disturbances for the magnetic mount whip antenna. It should be noted that the FM-MC4™, antenna and cable were professionally calibrated at Audemat Labs in Paris on 4/7/2010.



Exterior

Length: 201.8 in.

Width: 75.9 in.

Height: 68 in.

Wheel Base: 117.9 in.

Curb Weight: 4643 lbs.

Figure Ten: Test Vehicle

RF MEASUREMENT RESULTS

| Non-Targeted Tests | | | | | |
|--------------------------------|---------------------------------|-----------------------------------|--------------------|------------------------------|------------------------|
| | Absolute field dB μ V | Relative field dB μ V/m | MPX Level (kHz) | Pilot subcarrier (kHz) | Multipath ratio (%) |
| OGDEN-BOUNTIFUL1 | 38.29 | 51.46 | 79.02 | 6.34 | 6.17 |
| OGDEN1 | 41.71 | 54.88 | 63.81 | 6.99 | 9.24 |
| OGDEN2 | 53.15 | 66.32 | 54.60 | 6.16 | 4.25 |
| OGDEN3 | 60.71 | 73.88 | 53.22 | 6.09 | 25.95 |
| BOUNTIFUL1 | 37.11 | 50.28 | 97.95 | 6.18 | 8.12 |
| BOUNTIFUL2 | 38.01 | 51.18 | 77.23 | 6.18 | 6.89 |
| BOUNTIFUL3 | 56.08 | 69.25 | 85.57 | 5.90 | 4.97 |
| SLC-BOUNTIFUL1 | 55.18 | 68.35 | 73.59 | 6.60 | 4.00 |
| SALT LAKE CITY1 | 51.04 | 64.21 | 60.70 | 5.91 | 2.83 |
| SALT LAKE CITY2 | 48.74 | 61.91 | 59.26 | 5.90 | 2.93 |
| SALT LAKE CITY3 | 52.83 | 66.00 | 56.70 | 5.88 | 5.89 |
| SALT LAKE CITY4 | 43.35 | 56.52 | 57.85 | 5.96 | 3.88 |
| SLC-PROVO1 | 29.64 | 42.81 | 64.86 | 6.35 | 7.49 |
| SLC-PROVO2 | 47.34 | 60.51 | 59.94 | 5.93 | 3.36 |
| SLC-PROVO3 | 34.77 | 47.94 | 73.04 | 6.62 | 8.94 |
| SLC-PROVO4 | 30.01 | 43.18 | 67.92 | 7.18 | 13.63 |
| PROVO1 | 49.84 | 63.01 | 69.05 | 6.65 | 9.58 |
| PROVO2 | 59.73 | 72.90 | 57.58 | 6.61 | 5.77 |
| PROVO3 | 46.49 | 59.65 | 57.44 | 6.75 | 13.07 |
| PROVO4 | 41.62 | 54.79 | 58.44 | 6.74 | 6.66 |
| Average of 20 Locations | 45.78 | 58.95 | 66.39 | 6.35 | 7.68 |

Table Four: Non-Targeted Spot Measured Parameters

| Targeted Tests | | | | | |
|--------------------------------|---------------------------------|-----------------------------------|--------------------|------------------------------|------------------------|
| | Absolute field dB μ V | Relative field dB μ V/m | MPX Level (kHz) | Pilot subcarrier (kHz) | Multipath ratio (%) |
| OGDEN-BOUNTIFUL1 | 39.61 | 52.78 | 89.13 | 6.08 | 7.09 |
| OGDEN1 | 44.09 | 57.26 | 70.97 | 6.68 | 8.32 |
| OGDEN2 | 51.36 | 64.53 | 65.24 | 6.46 | 9.08 |
| OGDEN3 | 62.70 | 75.87 | 62.58 | 5.93 | 3.03 |
| BOUNTIFUL1 | 39.04 | 52.21 | 82.48 | 5.91 | 6.17 |
| BOUNTIFUL2 | 36.95 | 50.12 | 82.61 | 5.93 | 6.47 |
| BOUNTIFUL3 | 56.34 | 69.51 | 79.61 | 5.92 | 2.85 |
| SLC-BOUNTIFUL1 | 57.16 | 70.33 | 72.45 | 6.19 | 3.52 |
| SALT LAKE CITY1 | 53.03 | 66.20 | 67.88 | 5.90 | 18.33 |
| SALT LAKE CITY2 | 48.58 | 61.74 | 65.27 | 5.88 | 4.70 |
| SALT LAKE CITY3 | 60.20 | 73.36 | 65.78 | 5.88 | 2.88 |
| SALT LAKE CITY4 | 39.09 | 52.26 | 72.79 | 6.23 | 6.19 |
| SLC-PROVO1 | 34.37 | 47.54 | 73.45 | 6.10 | 9.50 |
| SLC-PROVO2 | 44.06 | 57.23 | 67.29 | 5.89 | 4.48 |
| SLC-PROVO3 | 36.97 | 50.14 | 83.31 | 6.58 | 23.47 |
| SLC-PROVO4 | 28.83 | 42.00 | 97.85 | 8.47 | 26.49 |
| PROVO1 | 49.46 | 62.63 | 72.48 | 6.70 | 22.26 |
| PROVO2 | 59.73 | 72.90 | 69.28 | 6.66 | 3.53 |
| PROVO3 | 46.02 | 59.19 | 71.26 | 6.66 | 12.30 |
| PROVO4 | 41.39 | 54.56 | 69.35 | 6.74 | 7.23 |
| Average of 20 Locations | 46.45 | 59.62 | 74.05 | 6.34 | 9.40 |

Table Five: Targeted Spot Measured Parameters

It is interesting to note that the difference between the measured RF signal level between the Non-Targeted and Targeted Spot locations is only 0.67 dB on average (the Targeted measurements slightly higher), indicating the measurement locations were positioned soundly for both measurements. Not surprisingly, the MPX and Multipath ratio was 11% and 22% higher, respectively, for the Targeted measurements. Much of this can be attributed to the SLC-PROVO3, SLC-PROVO4, and PROVO1 Targeted-Spot measurements where the multipath ratio was considerably higher, presumably due to the different content being received from multiple boosters. Also of note was the pilot carrier stability, which varied only 1.1% for the average of the two measurements.

IV. RF ANALYSIS OF THE TEST AREA

It is important to emphasize that no changes were made to the RF broadcast sites in terms of power, antennas, etc. at the KDUT broadcast stations. Because of the well designed booster placement and the uniqueness of the terrain, it was desired to see if implementing targeted messaging without any RF re-engineering could be successful, which was accomplished successfully as this report indicates.

60 dBu CONTOURS

The Broadcast (Part 73) propagation models are essentially simplified statistical methods of estimating field strength and coverage based only on a station's effective radiated power (ERP) and height above average terrain (HAAT). Since the terrain information is averaged, the model does not take into account specific individual localized obstructions or shadowing. Also, since the average used for this model only includes the terrain between three and 16 kilometers from the transmitter site, terrain obstructions outside of this range are ignored. This means that identical results will be calculated whether or not a transmitting antenna has clear line of sight or complete blockage by an obstruction in the first three kilometers portion of a path. Likewise, any terrain obstructions beyond 16 kilometers that block the line of sight to a more distant receiving antenna are ignored. The main use of this model is for license applications or other submissions to the FCC which specifically require the use of the methods described in Part 73.

Designated as F(50,50) (Estimated field strength exceeded at 50% of the potential receiver locations for at least 50% of the time at a receiving antenna height of 9.1 meters), the protected service contours for FM stations are the 54 dB μ V/m for commercial Class B stations, 57 dB μ V/m for commercial Class B1 stations, and 60 dB μ V/m (1 mV/m) for commercial Class A, C3, C2, C1, and C stations, as well as 60 dB μ V/m for all classes of noncommercial educational stations (including low power FM (LPFM) stations). City coverage for commercial FM stations is defined by the F(50,50) 70 dB μ V/m contour, per Part 73.315. Comparatively, TIREM, Okumura, and Longley-Rice are more analytical models that consider a number of other factors, such as individual obstructions (either terrain or manmade), terrain roughness, Land Use Land Clutter (LULC) information, etc.

The 60 dBu contours for the KDUT stations, along with the test locations, are presented in the four distinct geographical test areas. These plots, along with the Longley-Rice RF prediction plots, were generated with the V-Soft Probe 4 Professional software.



Figure 11: Ogden Area Contour and Test Locations

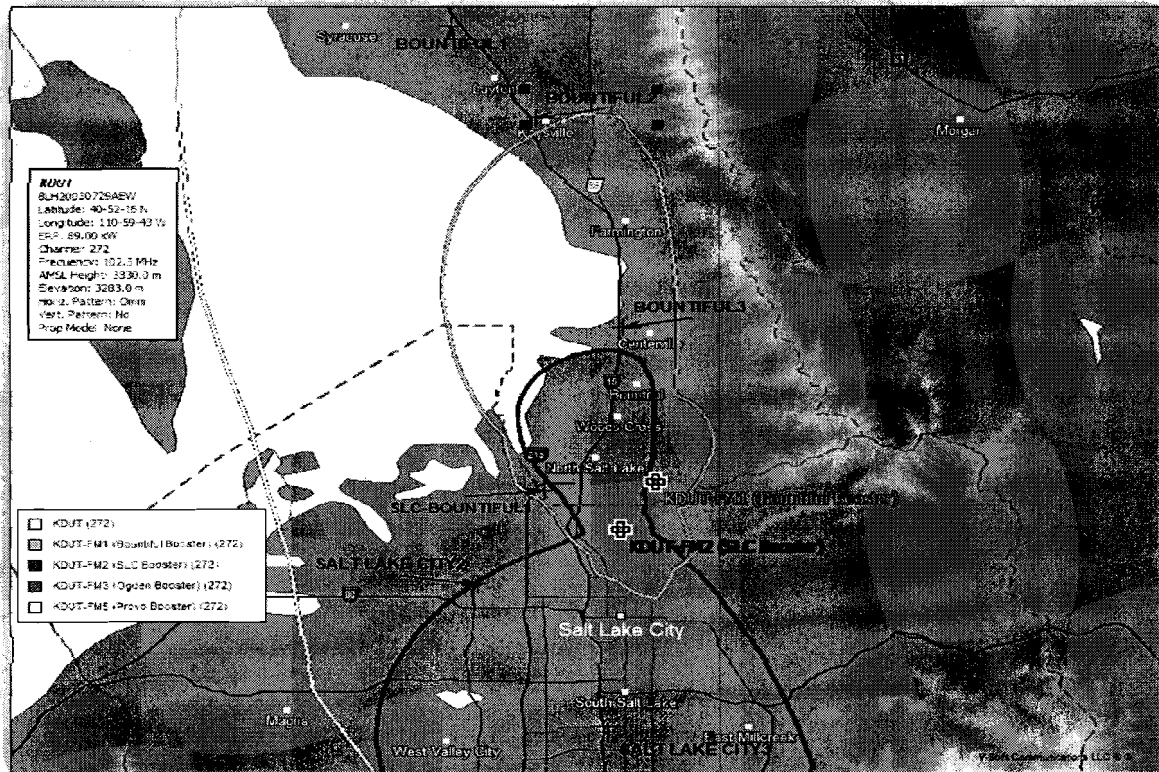


Figure 12: Bountiful Area Contour and Test Locations

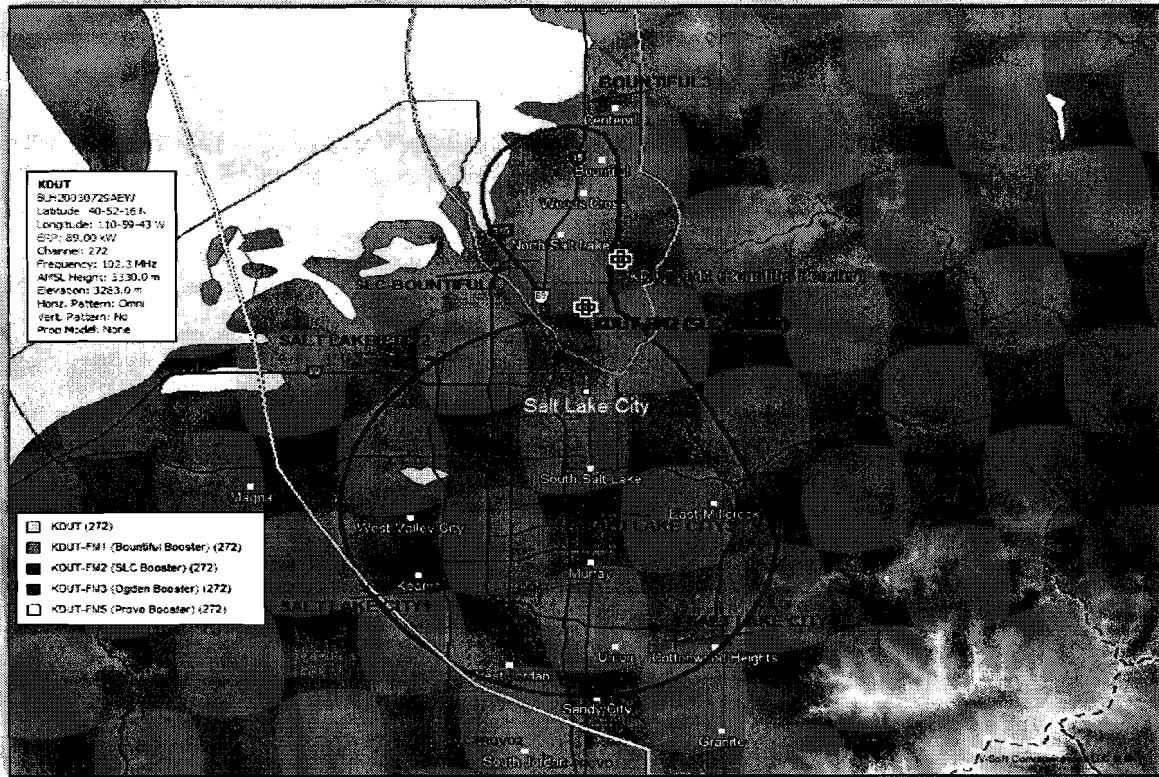


Figure 13: Salt Lake City Area Contour and Test Locations

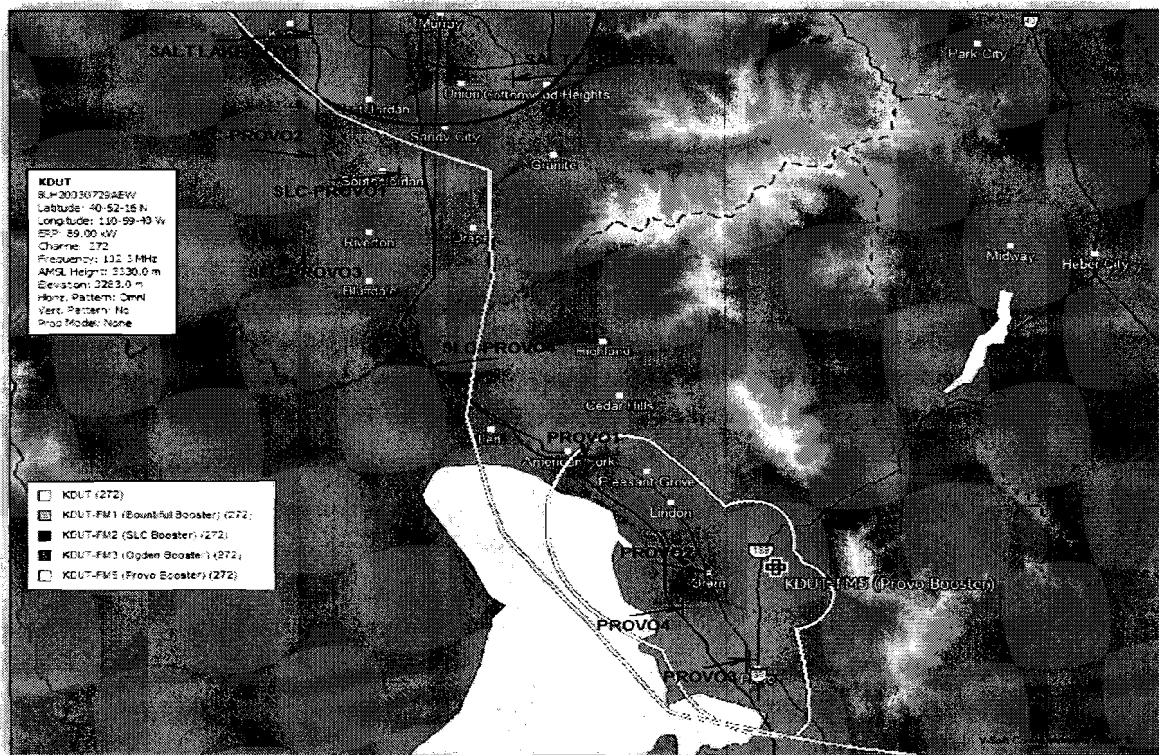


Figure 14: Provo Area Contour and Test Locations

LONGLEY-RICE RF COVERAGE AND D/U PREDICTIONS

It is helpful to illustrate the four distinct market segregations from a RF propagation examination. Therefore, a Longley-Rice prediction of the coverage of the main and four booster locations is used, at a height of the measurement antenna on the measurement vehicle (1.8 meters) and a cutoff field strength of 40 dBμV/m.

In addition to the RF coverage prediction, Desired-to-Undesired ratios were calculated for each of the 20 test locations, as this assists in the evaluation of possible interference that may exist.

| | Targeted Tests | | Non-Targeted Tests | | Average Quality | D/U Ratio dB |
|--------------------------------|-----------------------|-------------------------|-----------------------|-------------------------|-----------------|--------------|
| | Absolute field : dBμV | Relative field : dBμV/m | Absolute field : dBμV | Relative field : dBμV/m | | |
| OGDEN-BOUNTIFUL1 | 39.61 | 52.78 | 38.29 | 51.46 | 3.66 | 7.76 |
| OGDEN1 | 44.09 | 57.26 | 41.71 | 54.88 | 3.87 | 26.72 |
| OGDEN2 | 51.36 | 64.53 | 53.15 | 66.32 | 4.50 | 35.48 |
| OGDEN3 | 62.70 | 75.87 | 60.71 | 73.88 | 4.50 | 50.73 |
| BOUNTIFUL1 | 39.04 | 52.21 | 37.11 | 50.28 | 3.77 | 11.33 |
| BOUNTIFUL2 | 36.95 | 50.12 | 38.01 | 51.18 | 3.96 | 11.82 |
| BOUNTIFUL3 | 56.34 | 69.51 | 56.08 | 69.25 | 3.92 | 26.11 |
| SLC-BOUNTIFUL1 | 57.16 | 70.33 | 55.18 | 68.35 | 4.07 | 4.38 |
| SALT LAKE CITY1 | 53.03 | 66.20 | 51.04 | 64.21 | 4.50 | 19.28 |
| SALT LAKE CITY2 | 48.58 | 61.74 | 48.74 | 61.91 | 4.50 | 7.88 |
| SALT LAKE CITY3 ¹ | 60.20 | 73.36 | 52.83 | 66.00 | 4.50 | 19.71 |
| SALT LAKE CITY4 ² | 39.09 | 52.26 | 43.35 | 56.52 | 4.32 | 29.71 |
| SLC-PROVO1 | 34.37 | 47.54 | 29.64 | 42.81 | 4.19 | 27.61 |
| SLC-PROVO2 | 44.06 | 57.23 | 47.34 | 60.51 | 4.50 | 15.09 |
| SLC-PROVO3 | 36.97 | 50.14 | 34.77 | 47.94 | 3.69 | 18.53 |
| SLC-PROVO4 | 28.83 | 42.00 | 29.09 | 42.26 | 3.49 | 39.74 |
| PROVO1 | 49.46 | 62.63 | 49.84 | 63.01 | 4.43 | 35.96 |
| PROVO2 | 59.73 | 72.90 | 59.73 | 72.90 | 4.50 | 42.48 |
| PROVO3 | 46.02 | 59.19 | 46.49 | 59.65 | 4.50 | 36.72 |
| PROVO4 | 41.39 | 54.56 | 41.62 | 54.79 | 4.50 | 25.11 |
| Average of 20 Locations | 46.45 | 59.62 | 45.74 | 58.91 | 4.19 | 24.61 |

Table Six: Desired-to-Undesired Ratios

From observation of the above table, it can be seen the D/U ratio varies from a low of 4.38 dB (SLC-BOUNTIFUL1, where there is significant simulcast overlap) to a high of 50.73 dB (OGDEN3, where the measurement location is very close to the Ogden booster). Two other notes of interest, locations SALT LAKE CITY3 and SALT LAKE CITY4 had a difference in measured signal levels of 7.37 dB and 4.26 dB respectively, two of the highest differences in the test. These two measurement locations are different than the typical measurement location in that the parking lots were smaller, and other cars passing by in close proximity during the spot recording occurred, which could explain the larger difference in signal level. Overall the average D/U ratio is a healthy 24.61 dB, again illustrating the combination of good booster placement and significant terrain blockage isolation.

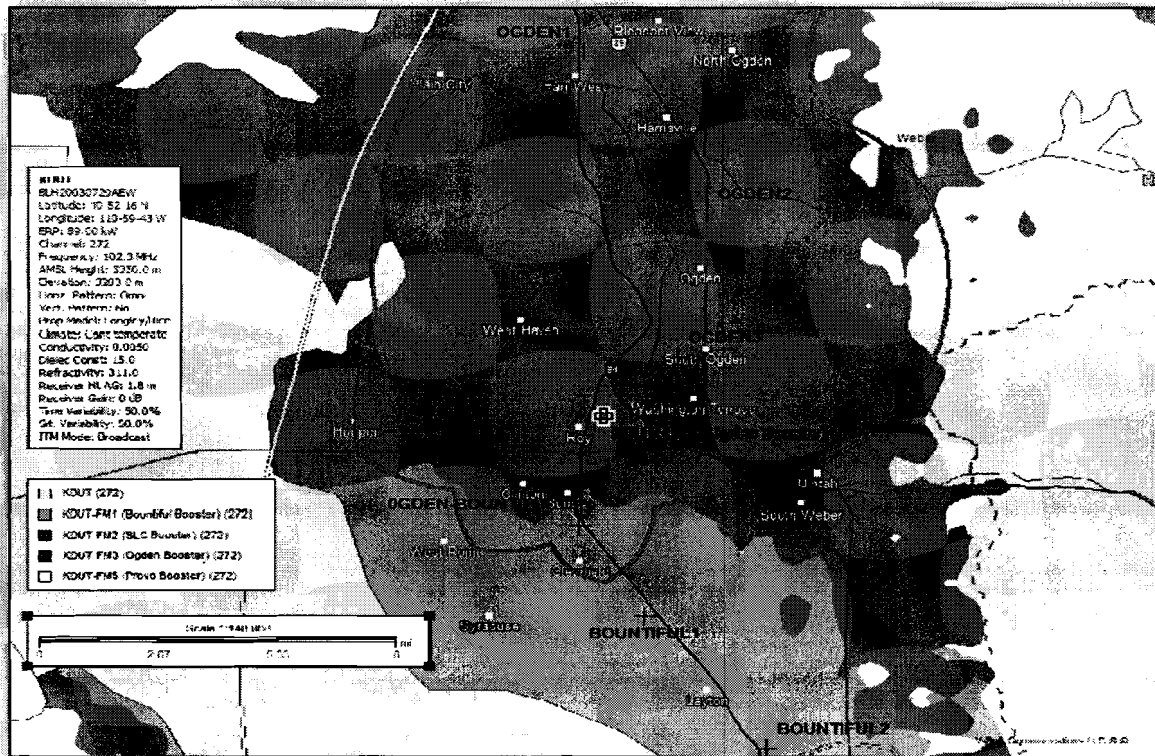


Figure 15: Ogden Longley-Rice Coverage Area

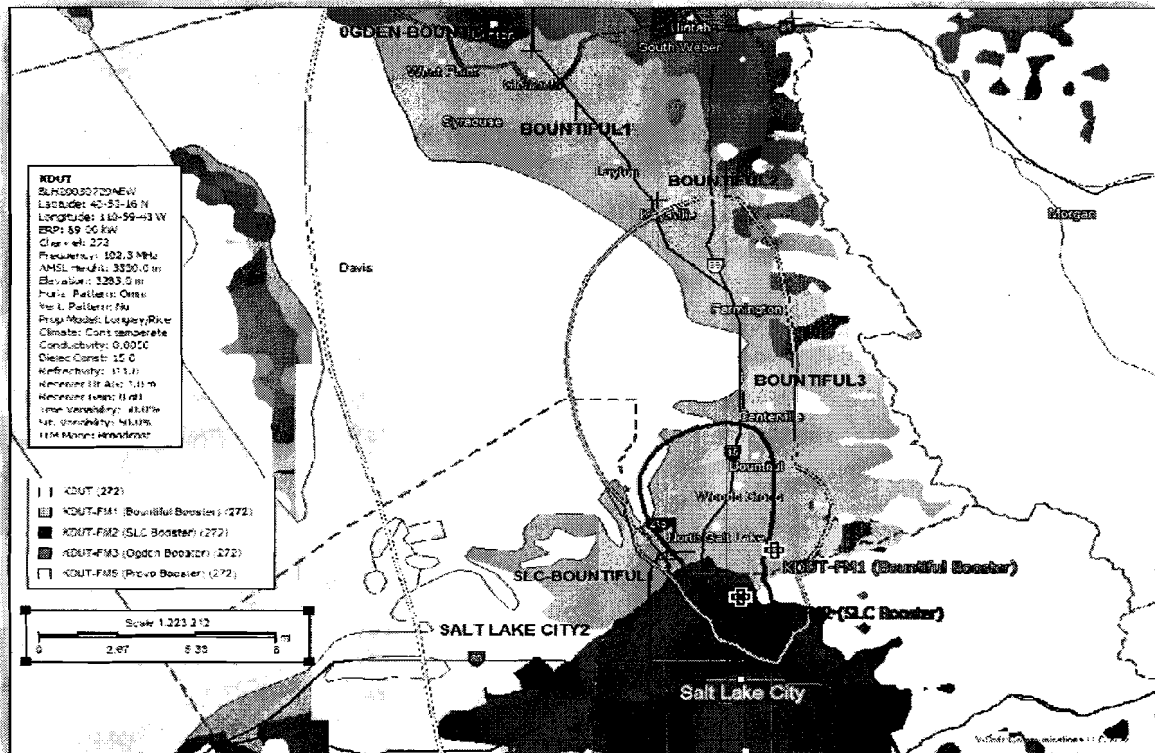


Figure 16: Bountiful Longley-Rice Coverage Area

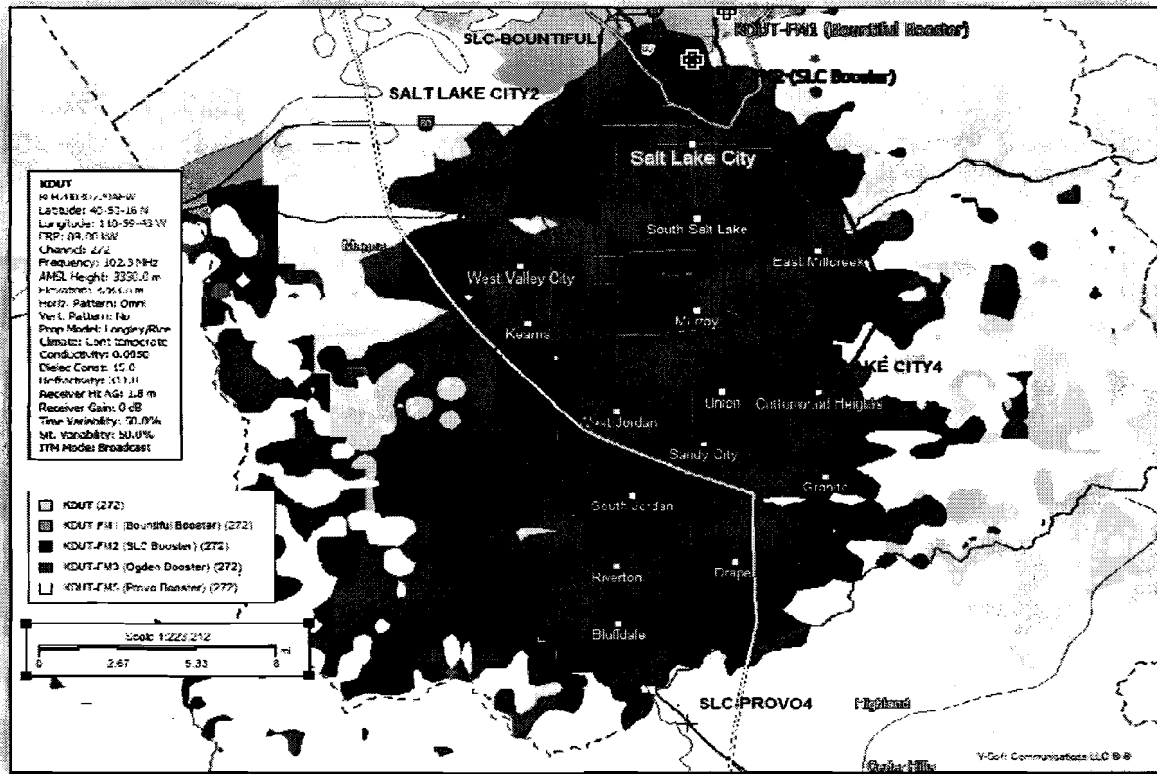


Figure 17: Salt Lake City Longley-Rice Coverage Area

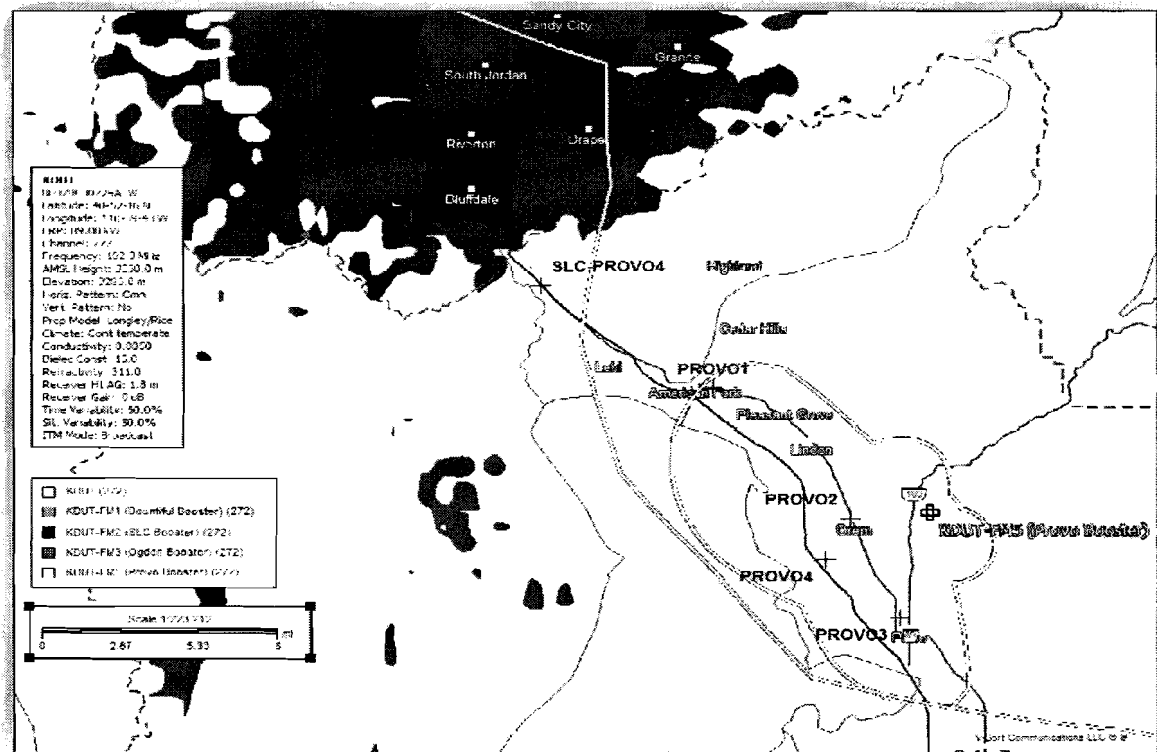


Figure 18: Provo Longley-Rice Coverage Area

V. NETWORK INFRASTRUCTURE AND TARGETED SPOT INSERTION

WiMAX OVERLAY AND DISTRIBUTION NETWORK

Because no change was made to the existing KDUT(FM) studio-to-transmitter (STL) distribution network, a method of sending distinct audio messages to several of the boosters was needed during the Targeted PSA spot times. This was accomplished by constructing a separate WiMAX wireless distribution network from the KDUT(FM) studio to the Salt Lake City booster and to the Ogden booster. This provided for independent distribution of different targeted audio messages on overlapping boosters during the Targeted messaging spot times. In actuality, it was not feasible to make a change to the existing STL distribution (shown below) as the version of Harris Synchrocast™ was at least 7 years old and non-IP based, and with limited bandwidth (typically a T1) there was not excess capacity to add additional audio streams with control information to indicate to the broadcast transmitter to switch audio sources during the Targeted spot times.

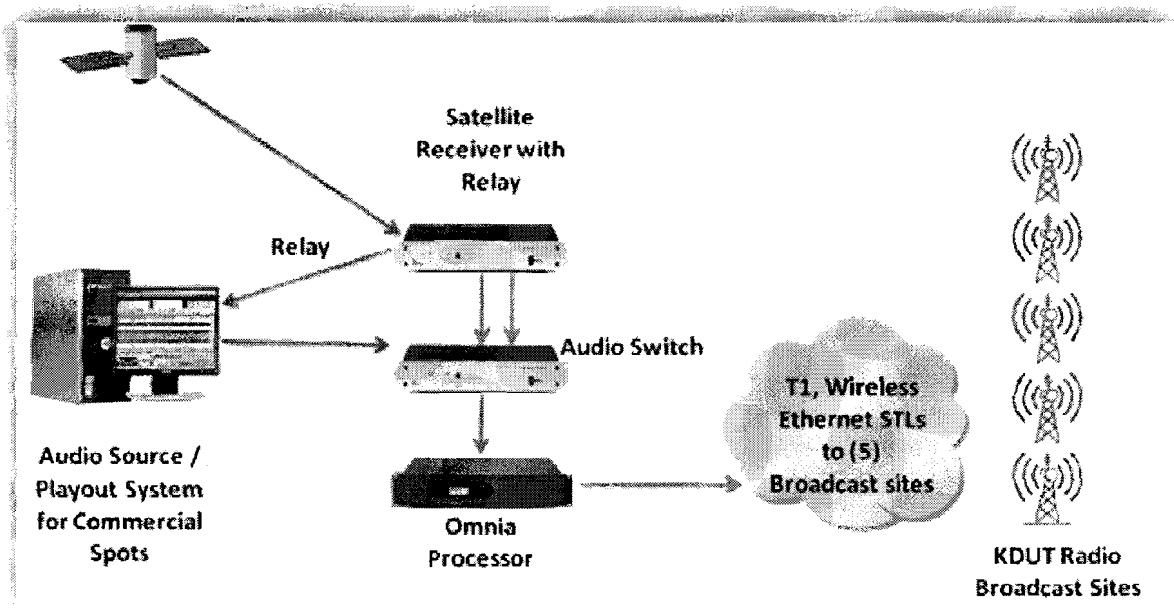


Figure 19: Current Audio and STL Distribution Network

THE LAZER SPOTS™ ‘DBH CONTROL UNIT’ (Patent Pending)

The Lazer Spots™ ‘DBH Control Unit’ is defined as a proprietary implementation of hardware and software that typically resides at the broadcast studio. The ‘DBH Control Unit’ design directs different audio feeds from new and existing automation and playout equipment (such as RCS -Prophet Systems, ENCO Systems, AudioVault-Broadcast Electronics, Scott Studios, Computer Concepts -Maestro, BSI Simian, WideOrbit- former Google automation, OMT Technologies -iMediatouch and others), through the ‘DBH Control Unit’ to different transmitter sites, while simultaneously turning the transmitters on and off (and/or increasing and decreasing the transmitters power) in synchronization with the new audio targeted audio feeds.

The 'DBH Control Unit' design is based on Ethernet, a mature technology which is the clear direction for audio routing. The major components use equipment which is 100% compatible with Ethernet networking standards, including Cisco networking equipment. The same network that switches and distributes live, linear audio targeted channels also carries GPIO signals, file transfers, and any other standard IP data.

The hardware and software that the 'DBH Control Unit' houses includes analog and digital input and output interfaces, General Purpose Input and Output (GPIO) logic interfaces, both trigger (TTL low-level voltage) and contact closure relays connections, routing software which controls consolidated access to all interfaces, and a Cisco Catalyst-Ethernet switch to connect interface nodes, PCs, WAN devices, and an internal playout system thru 10/100/1000 Mbps ports. The 'DBH Control Unit' performs timed updates (or via contact closure or audio detection) to reconfigure a few or many sources and destinations simultaneously. It also can provide the generation of Target spot audio if necessary.

ROUTING, SWITCHING, AND CONTROL FOR TARGETED SPOT DELIVERY

Each implementation of the 'DBH Control Unit' will vary in configuration depending on the broadcast studio audio equipment and STL interfaces. For KDUT(FM), during the Targeted spot time (two to three times per hour), pre-produced 30 second Targeted spot audio streams were generated with a PC running multiple playout system software instances. A relay trigger pulse from the existing on-air playout system to the 'DBH Control Unit' initiated the generation of Targeted audio playout streams. This was done by creating a script command in the existing playout system before each of the Targeted spots to pulse a relay that was connected to a trigger on the 'DBH Control Unit' multiple instance internal playout system. Once the trigger was pulsed, several new audio streams (the pre-produced Target spots) as well as GPIO control information were generated and output to an Ethernet switch/router at the IP network level.

The Ethernet switch/router interfaced directly with a WiMAX overlay distribution network. The WiMAX network connected directly to a wireless router at the Salt Lake City booster transmission site. At this site another wireless connection was made to the Ogden booster transmission site. A high-level architectural diagram of the KDUT(FM) Targeted audio distribution is shown below.

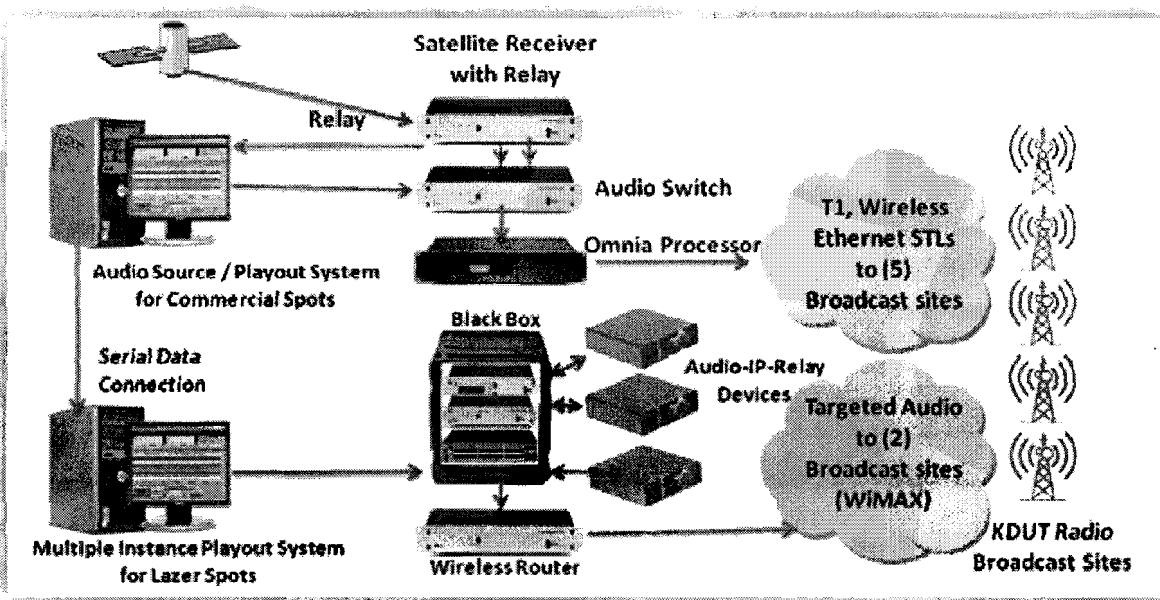


Figure 20: Target Spot Audio and STL Distribution Network

At the WiMAX connected booster sites, an audio switch controlled the digital audio from the current Harris Synchrocast™ stream and the new Targeted digital audio stream by using the GPIO signals generated at the ‘DBH Control Unit’. This approach worked very well as the existing broadcast distribution system was not designed to perform this targeting messaging approach. There was one minor issue with the audio at these booster sites such that during the switch of audio sources there is a very brief but noticeable dropout of the broadcast RF signal. It is believed this may be due to the Harris Synchrocast™ system trying to resynchronize the new digital AES audio stream. It is important to note that if this concept were deployed in a non-test full time broadcast environment, a solution to prevent this would be implemented. The solution would be dependent on the new STL distribution network architecture for Targeted spot messaging. A high-level architectural diagram of the implemented KDUT(FM) Target audio test distribution is shown below.

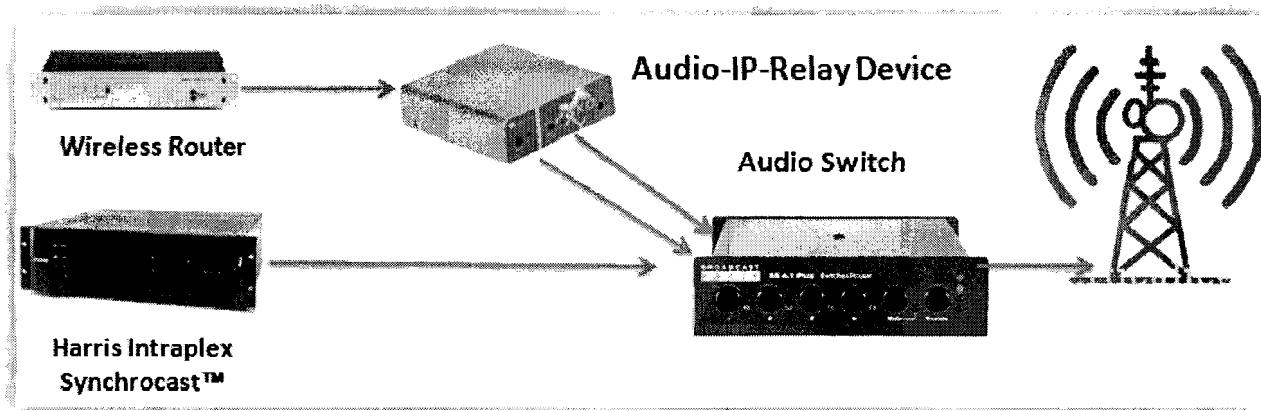


Figure 21: Targeted Spot Booster Site Implementation

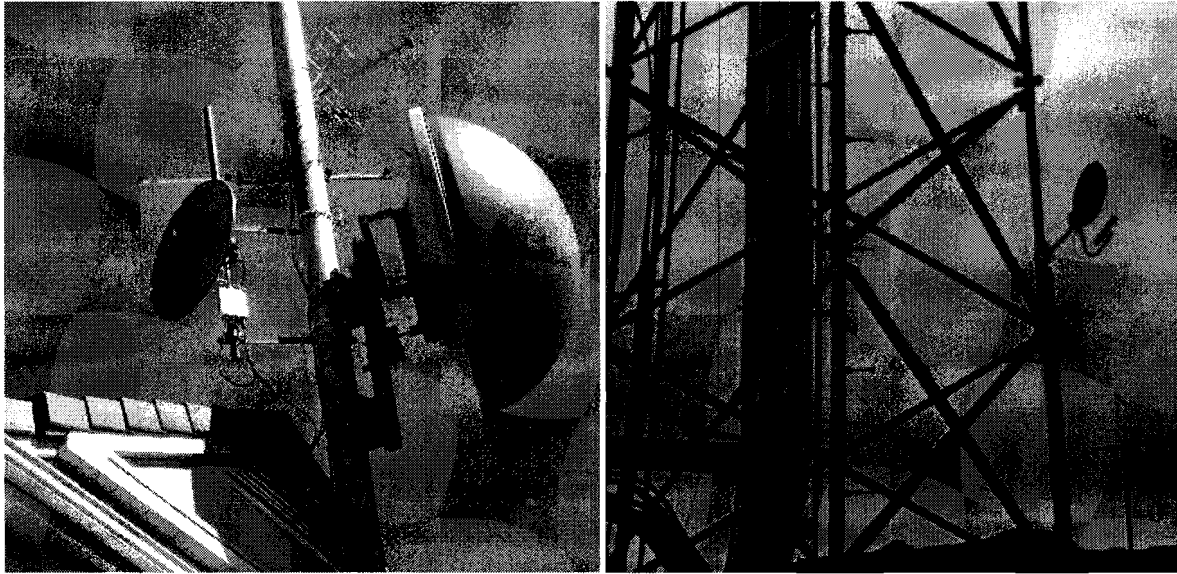


Figure 22: WiMax Overlay Distribution Studio-to-Booster Site Equipment

VI. ANALYSIS AND RATING OF THE AUDIO AND EFFECTIVENESS OF TARGETED SPOT DELIVERY WITH BOOSTERS

AUDIO SAMPLE RECORDINGS

In the KDUT(FM) service contour, the four boosters create four distinct coverage areas, in terms of RF isolation and segregated markets. Distinct Public Service Announcements (PSAs) were tested as each market area was playing a different PSA spot at the same time. For KDUT(FM), radio spots (non-commercial and commercial) start at :26, :42, and :56 minutes of each hour, and the main program is a syndicated feed (La Gran D 102.3 FM, a Spanish station broadcasting a Mexican music format) from a satellite link originating in Sacramento. The test PSAs were 30 seconds in length each, and occurred 2 to 3 times per hour depending on spot availability.

Preliminary testing occurred on 6/1/2010 to 6/7/2010 to determine appropriate test locations and drive distances between test locations. It is important to mention that 15 minutes or 30 minutes elapsed between spots, so drive distances had to be determined- typically 5-10 miles apart, and compensated by roads, construction delays, and alternate routes for high traffic or accidents. A typical test location was in an empty large parking lot with no close obstructions.

The submitted audio clips were recorded in the field on 6/23/2010 to 6/25/2010. Audio information was collected at 20 geographical locations as described in this report. At each of the 20 test locations, a measurement of the Non-Targeted, normal simulcast audio was made for a single PSA spot. This is referred to as the reference PSA spot and used as a comparative reference to the Targeted spot. For the targeted-test mode, distinct spots were broadcast on each adjacent booster. These spots were not in simulcast synchronization mode, as normally would be the case. The goal was to monitor and analyze the audio at the 20 test locations for quality of reception as compared to the Non-Targeted PSA spot.

At each of the 20 measured locations, each audio file attached with this report has the following format:

- Approximately 85 seconds in length.
- 5 seconds of audio before the Non-Targeted spot, the 30 second Non-Targeted spot, 5 seconds of audio after the Non-Targeted spot.
- 5 seconds of silence.
- 5 seconds of audio before the Targeted spot, the 30 second Targeted spot, 5 seconds of audio after the Targeted spot.

This format allows the listener to easily compare subjectively the Non-Targeted PSA reference spot audio to the Targeted spot audio.

NON TARGETED (SIMULCAST) PSA AUDIO SPOT

As mentioned, at each of the 20 test locations a measurement of the Non-Targeted, normal simulcast audio were made for a single PSA spot. This is referred to as the reference PSA spot. The following is the Non-Targeted Reference 30 second PSA Spot, transcribed to English:

National Foundation For Credit Counseling Inc. (Simulcast on all Boosters)

Ana V/O Dude, that is a pretty picture. You must be very proud.

Carlos V/O Yes, and see you, Peter, and I have only been in this country three years and already have a house.

Ana V/O Yeah, but my job is at risk and we could lose the house.

Carlos V/O We had the same problem, you need to act now.

Announcer V/O For free help in Spanish, call 1-800-682-9832 or visit nopierdastuhogarpunto O-R-G

A public service from the National Foundation for Credit Counseling Inc.

TARGETED (NON-SIMULCAST) PSA AUDIO SPOTS

For the targeted-test mode, distinct spots were broadcast on each adjacent booster. These spots were not in simulcast synchronization mode, as normally would be the case. The goal was to monitor and analyze the audio at the 20 test locations for quality of reception as compared to the non-targeted PSA spot. Each spot is 30 seconds in length and transcribed to English:

Habitat for Humanity's Salt Lake City ReStore (Broadcast on the Ogden Booster)

Cleaning out the garage? Have unused home improvement items? Clean up and help your community all at the same time. The Habitat for Humanity ReStore in Salt Lake City, 1276 South 500 West. Buy supplies, donate supplies or volunteer your time. Brand new doors only \$10 or used doors for \$5.00. Friday and Saturday, 50% off lawn and garden supplies. Come on in to the habitat restore today! 1276 south 500 west.

Utah Hispanic Chamber of Commerce (Broadcast on the SLC Booster)

The Utah Hispanic Chamber of Commerce is a net of companies, associations and entrepreneurs that promote the economic growth in the state. The Chamber promotes its members: leadership,

opportunities to grow, professional growth and community participation. Show off your business at our events increase your contacts, better your operation, find your next partner or client, and meet important people in the community and prominent businessmen. For more information contact us at 801-532-3308 or visit hcc.com. We invite you to become a member of the Utah Hispanic Chamber of Commerce.

*Habitat for Humanity's Orem ReStore (Broadcast on the Bountiful and Provo Booster²)
Cleaning out the garage? Have unused or barely used home improvement items? Don't trash them; restore them at Habitat for Humanity's new Orem ReStore! If you like building and home improvement supplies at 50 – 75% off come to the new ReStore at 340 South Orem Blvd. in Orem. Buy supplies, donate supplies, or volunteer your time... because all proceeds help build Habitat for Humanity homes! Visit the new ReStore at 340 South Orem Blvd. in Orem.*

OBJECTIVE AUDIO ANALYSIS FOR NON-TARGETED/TARGETED SPOTS RESULTS

The measurement receiver and collection software, GoldenEar™ developed by WorldCast Systems.com/Audemat division, is described in other sections. The GoldenEar™ software is meant to provide a numerical method for quantifying a pure subjective concept, which is quality of received FM audio. As the method is a numerical one, it will be applied every time the same way, therefore it is an objective measure, as opposed to having numerous subjects listen and evaluate the audio.

The GoldenEar™ quality algorithm uses measured data to form a quality rating, ranging from 1 to 5, 5 being the best and 1 being the worst. An indication of the grading scale algorithm is intended to be analogous to ITU-R (BS.1284-1)³ recommendations. The following five-grade scale is appropriate for the assessment of sound quality and impairment for the grading of the KDUT(FM) test audio samples which is specified by the ITU-R recommendations.

| Quality | | Impairment | |
|---------|-----------|------------|-------------------------------|
| 5 | Excellent | 5 | Imperceptible |
| 4 | Good | 4 | Perceptible, but not annoying |
| 3 | Fair | 3 | Slightly annoying |
| 2 | Poor | 2 | Annoying |
| 1 | Bad | 1 | Very annoying |

Table Seven: ITU-R Grading Scales

For comparison tests, the following ITU-R comparison scale is based on numerical differences using the above five-grade scales for the purposes of comparing the Non-Targeted PSA reference spot to the Targeted PSA spots.

² Due to the distance between Bountiful and Provo, and the multiple extreme terrain blockages between these two boosters, no significantly quantifiable RF interference exists between these two boosters. Because the WiMAX overlay distribution network did not reach these sites, KDUT had to broadcast the same spots as explained in the Network Infrastructure and Targeted Spot Insertion section.

³ RECOMMENDATION ITU-R BS.1284-1*General methods for the subjective assessment of sound quality

| Comparison | |
|------------|-----------------|
| 3 | Much better |
| 2 | Better |
| 1 | Slightly better |
| 0 | The same |
| -1 | Slightly worse |
| -2 | Worse |
| -3 | Much worse |

Table Eight: ITU-R Comparison Scales

As indicated in Table Nine, the Non-Targeted Simulcast PSA spot had an objective quality range of 3.54 to 4.5, with a 20 location average of 4.23. The Targeted PSA spots had an objective quality range of 2.94 to 4.5, with a 20 location average of 4.15. The difference between the two averages is 0.07, with the Non-Targeted result being less than a Slightly Better rating when compared to the Targeted results as indicated in Table Nine.

| Test Location | Non-Targeted Tests | | | Targeted Tests | | |
|--------------------------------|--------------------|-------|----------------------------|----------------|-------|----------------------------|
| | Date | Time | Objective Quality Analysis | Date | Time | Objective Quality Analysis |
| OGDEN-BOUNTIFUL1 | 6/23/10 | 10:56 | 3.65 | 6/25/10 | 10:41 | 3.68 |
| OGDEN1 | 6/23/10 | 11:26 | 4.13 | 6/25/10 | 10:56 | 3.62 |
| OGDEN2 | 6/23/10 | 11:41 | 4.50 | 6/25/10 | 11:26 | 4.50 |
| OGDEN3 | 6/23/10 | 11:56 | 4.50 | 6/25/10 | 11:41 | 4.50 |
| BOUNTIFUL1 | 6/24/10 | 15:26 | 3.54 | 6/25/10 | 12:26 | 4.00 |
| BOUNTIFUL2 | 6/24/10 | 15:41 | 3.93 | 6/25/10 | 12:41 | 4.00 |
| BOUNTIFUL3 | 6/24/10 | 15:56 | 3.83 | 6/25/10 | 12:56 | 4.00 |
| SLC-BOUNTIFUL1 | 6/24/10 | 10:56 | 4.00 | 6/25/10 | 14:56 | 4.15 |
| SALT LAKE CITY1 | 6/24/10 | 9:56 | 4.50 | 6/25/10 | 13:41 | 4.50 |
| SALT LAKE CITY2 | 6/24/10 | 10:26 | 4.50 | 6/25/10 | 14:26 | 4.50 |
| SALT LAKE CITY3 | 6/24/10 | 10:41 | 4.50 | 6/25/10 | 14:41 | 4.50 |
| SALT LAKE CITY4 | 6/24/10 | 11:26 | 4.50 | 6/25/10 | 15:26 | 4.15 |
| SLC-PROVO1 | 6/24/10 | 12:26 | 4.37 | 6/25/10 | 19:26 | 4.00 |
| SLC-PROVO2 | 6/24/10 | 12:41 | 4.50 | 6/25/10 | 19:41 | 4.50 |
| SLC-PROVO3 | 6/24/10 | 12:56 | 3.71 | 6/26/10 | 9:26 | 3.68 |
| SLC-PROVO4 | 6/24/10 | 13:26 | 4.05 | 6/26/10 | 9:41 | 2.94 |
| PROVO1 | 6/24/10 | 13:56 | 4.50 | 6/26/10 | 10:26 | 4.37 |
| PROVO2 | 6/24/10 | 14:26 | 4.50 | 6/26/10 | 10:41 | 4.50 |
| PROVO3 | 6/24/10 | 14:41 | 4.50 | 6/26/10 | 10:56 | 4.50 |
| PROVO4 | 6/24/10 | 14:56 | 4.50 | 6/26/10 | 11:26 | 4.50 |
| Average of 20 Locations | | | 4.23 | | | 4.15 |

Table Nine: Objective Audio Test Results

Based on the fact that no RF broadcast network design changes were implemented, good correlation between the objective calculation and the subjective audio clips, and the fact that all PSA spots were completely perceptible, it is concluded that the implementation of the Lazer Spots™ Targeted messaging test was shown to be extremely successful- it is believed that it could acceptably be implemented commercially. This comment is confirmed by the KDUT(FM) radio operations staff and feedback from them on the quality of the audio during the Targeted spots.

VII. APPENDIX ONE: AUDEMAT FM-MC4 CALIBRATION DATA

On April 7, 2010 the Audemat FM-MC4™, antenna and RF cable were sent to the Audemat Lab in Paris for calibration. Some of the calibration data is shown below.

ANTENNA CALIBRATION

This window displays antenna response curve to be displayed as well as different loss and gain values to be taken into account for calculating the field level's real value from the raw value supplied by the measuring equipment during station acquisition.

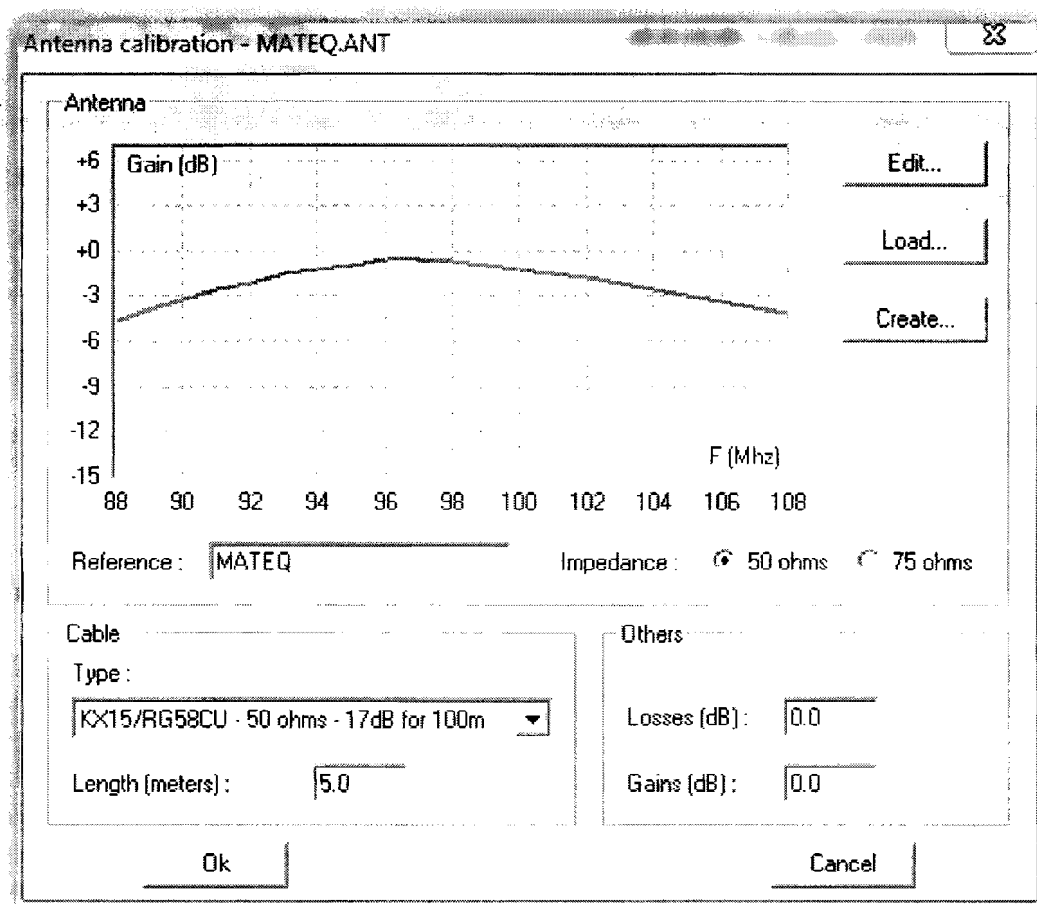


Figure 23: Antenna Calibration Curves

RECEIVER CALIBRATION

This window displays the receiver's response curve of the FM-MC4™ equipment used. The window displays the curves corresponding to different frequencies for which the equipment has been calibrated. These values are in the receiver calibration file which is loaded when the program is launched. This file is supplied with the equipment or when recalibrated in the factory.

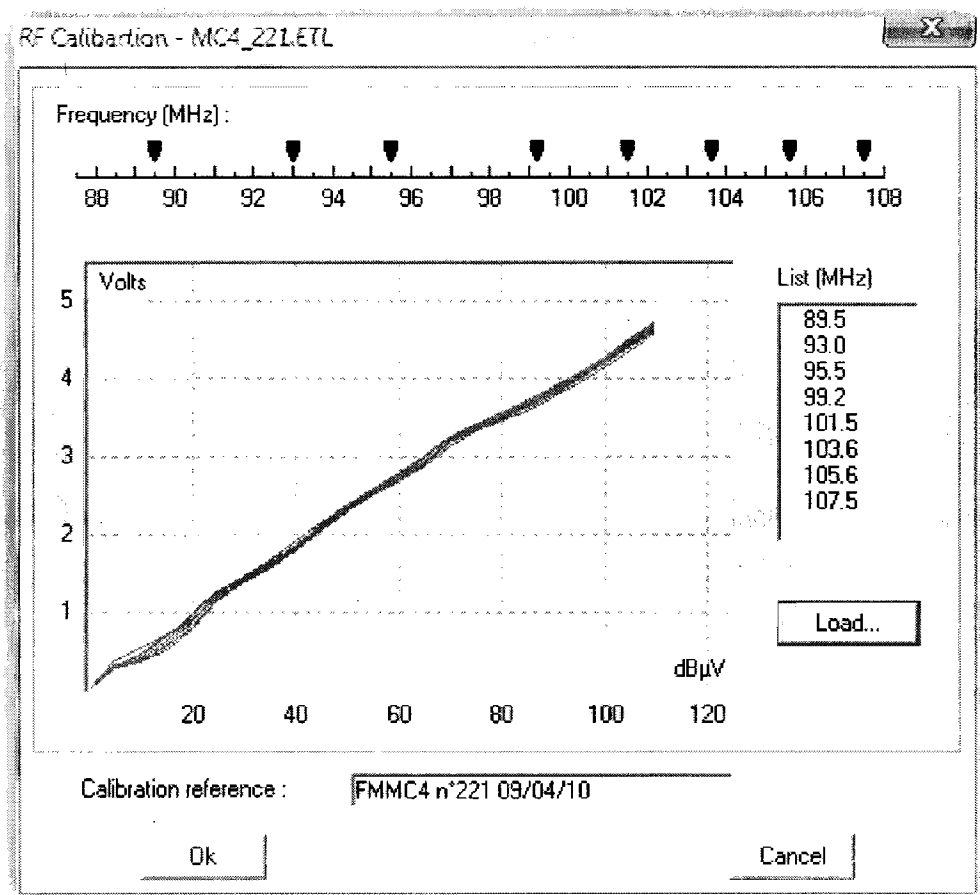


Figure 24: RF Receiver Calibration Curves

VIII. APPENDIX TWO: REFERENCE STANDARDS RELEVANT TO THIS REPORT

FCC AUDIO DIVISION

<http://www.fcc.gov/mb/audio/>

The Media Bureau licenses commercial and noncommercial educational AM, FM, FM Translator, and FM Booster radio services, and also the noncommercial educational Low Power FM radio service. The Division provides legal analysis of broadcast, technical and engineering radio filings and recommends appropriate disposition of applications, requests for waivers, and other pleadings. Telecommunications falls under **Title 47** of the CFR. AM, FM, and TV broadcast stations fall under **Part 73 and 74** of Title 47.

INTERNATIONAL TELECOMMUNICATIONS UNION (ITU)

ITU Radiocommunication Sector

<http://www.itu.int/ITU-R/index.html>

ITU-R BS.1114-5: Systems for terrestrial digital sound broadcasting to vehicular, portable and fixed receivers in the frequency range 30-3,000 MHz

ITU-R BS.412-9 17, ANNEX 3: Protection ratio for FM sound broadcasting in the case of the same programme and synchronized signals

ITU-R BS.1387-1: Method for objective measurements of perceived audio quality

ITU-R BS.1284-1 General methods for the subjective assessment of sound quality

WORLDCAST SYSTEMS / AUDEMAT DIVISION MENTION REFERENCES

<http://worldcastsystems.com/>

CCIR [Recommendation 638] : Terms and definitions used in planning frequencies for audio and television Broadcasting – Protection ratio in Audio Frequency

CCIR [Recommendation 559-2] : Objective measuring of RF protection ratios in broadcasting – parameters taken into consideration

CCIR [Recommendation 559-2] : Objective measuring of RF protection ratios in broadcasting – Standardised noise spectrum – Coloured noise signal used for generator modulation

CCIR [Recommendation 641] : Determining RF protection ratios in audio broadcasting at frequency modulation –Appendix 1 – Maximum deviation of measurement generator frequency

IUT-R [Recommendation BS.450-2] : Transmission standards for audio broadcasting at frequency modulation in metric waves

IUT-R [Recommendation 412-6] : Planning standards for audio broadcasting at frequency modulation in metric waves – Note 4 – Sinusoid signal power

IUT-R [Recommendation 412-7] : Planning standards for audio broadcasting at frequency modulation in metric waves – Appendix 4 – Measuring complete multiplex signal power and peak deviation of an FM audio broadcasting signal

IUT-R [Recommendation 642-1] : Limiters for high quality radio-phonetic programme signals
AFNOR 97330 :Weighting curve representing average musical messages

CEPT/ERC : [Recommendation ERC 54-01 E] – Method of measuring the maximum frequency deviation of FM Broadcast emissions in the band 87,5 MHz to 108 MHz at monitoring stations

UIT-R [Recommendation 704] : Characteristics of reference receivers in audio broadcasting at frequency modulation, at end of planning

UIT-R [Recommendation 599] : Audio broadcasting reception antenna directivity

ATTACHMENT A